

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Kent County, Maryland

By
H. B. WINANT, in Charge
and
J. P. BEWLEY
Maryland Agricultural Experiment Station



Bureau of Chemistry and Soils

**In cooperation with the Maryland Geological Survey
and the Maryland Agricultural Experiment Station**

BUREAU OF CHEMISTRY AND SOILS

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SYDNEY FRISSELL, *Editor in Chief*

SOIL SURVEY

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MARYLAND GEOLOGICAL SURVEY

EDWARD BENNETT MATHEWS, *State Geologist*

and

MARYLAND AGRICULTURAL EXPERIMENT STATION

H. J. PATTERSON, *Director*

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SOIL SURVEY OF KENT COUNTY, MARYLAND

By H. B. WINANT, in Charge, and J. P. BEWLEY, Maryland Agricultural Experiment Station

COUNTY SURVEYED

Kent County is in the northeastern part of Maryland, bordering the Delaware State line on the east. (Fig. 1.) It is separated from Cecil County on the north by Sassafras River. Chesapeake Bay borders it on the west, and Chester River forms the southern boundary. The land area of the county is 282 square miles, or 180,480 acres. Chestertown, the county seat, is about 30 miles east of Baltimore, 80 miles southwest of Philadelphia, and 60 miles southwest of Wilmington, Del.

Kent County lies on the watershed between Sassafras and Chester Rivers, subtended on the southwest by a marine terrace between Chester River and Chesapeake Bay. In the northern half and southwestern-central part of the county, the general surface features are those of an undulating or gently rolling plain, broken only by narrow strips of first-bottom soils along the small streams. On the south side of Sassafras River and in the northwest corner of the county along Chesapeake Bay, some escarpments rise from 30 to 80 feet above stream levels. The more noticeable of these are along Mill, Turner, Lloyd, and Stillpond Creeks and northeast of Sandy Bottom. These areas have steep slopes and represent the roughest surface relief in the county, but they are inextensive. The greater part of the land in Kent County lies favorably for farming operations.

The extreme southern part of the county, or that part lying to the south of Langford and Sandy Bottom and extending to the extreme southwestern corner, is known as Eastern Neck. Extending from this point north of Tolchester to the vicinity of Newtown and including the extreme southeastern end of the county are undulating or level areas and also broad flat areas and slight depressions. In the extreme southwestern end, the flatlands, or forelands, are indented by numerous creeks and bays, the chief one being Langford Bay. The largest level area, or slight depression, lies between Tolchester Beach and Sandy Bottom, and another large flat area lies west of Massey.

With the exception of comparatively small areas in the northern and southwest-central parts, the county is naturally well drained. The small streams have cut down from 10 to 20 feet below the general level of the country, and they ramify practically all the gently rolling or undulating upland, affording excellent drainage to practically every farm unit. Areas in the southwestern end of the county, in the extreme southeastern corner along the Delaware State line, around

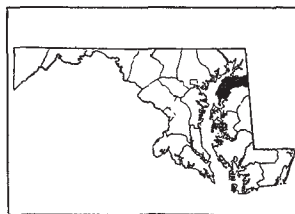


FIGURE 1.—Sketch map showing location of Kent County, Md.

Newtown and Worton, west of Massey, and southeast of Chestertown are so flat that natural surface drainage has not become established. Some of these areas have not been invaded by natural drainage ways, and, because of their extremely flat or slightly depressed surface relief, they hold water on the surface for a long time during the rainy season. Much of this land could be reclaimed by shallow canals and open ditches.

Most of the soils of Kent County have a sandy or sandy gravelly substratum which lies from 3 to 6 feet below the surface level. Excellent underdrainage is afforded over a large part of the county by this sandy material.

The drainage of Kent County is to the north into Sassafras River, south into Chester River, and west into Chesapeake Bay. No streams flow through or across the county. All the streams, except the rivers on the boundary lines, are short. Tidal streams extend only a short distance from Sassafras River and Chesapeake Bay and indent the extreme southwestern end of the county. In the northwest corner the tidal streams from Sassafras River and from the bay have cut channels from 30 to 80 feet deep, and the banks, particularly of those streams reaching out from Sassafras River, have steep slopes.

The elevation of Kent County ranges from sea level to 100 feet, the highest point being in Stillpond Neck in the northwestern part of the county. The elevation of the extreme southwestern end ranges from sea level to about 24 feet, and the elevation of the greater part of the county is between 30 and 80 feet.

Kent is the second oldest county in Maryland. It was represented in the first parliament, in 1649, just 15 years subsequent to the founding of the colony. The present area, however, is less extensive than formerly. The original settlers, who were largely of English descent, settled along the banks of the navigable streams.

Of a total population of 14,242, 67.7 per cent is native white, 1.1 per cent foreign-born white, and 31.2 per cent negro. The populations of the leading towns are as follows: Chestertown, the county seat, 2,809; Rock Hall, 714; Millington, 371; Betterton, 296; and Galena, 265. Other towns in the county are Stillpond, Massey, Kennedyville, and Golts.

The county is well supplied with transportation facilities. A branch of the Pennsylvania Railroad crosses the Delaware border near Golts and divides at Massey, one branch leaving the county at Millington and the other terminating at Chestertown.

Chesapeake Bay, together with Sassafras and Chester Rivers, affords a means of conveyance for heavy freight to within a few miles of the Delaware border. These waterways are still used to considerable extent for the transportation of bulky goods. Passenger traffic by waterway has been practically discontinued, except by the automobile ferry connecting Tolchester Beach and Baltimore.

The county has about 115 miles of hard-surfaced roads, mainly of concrete and tar-bound macadam, and it also has a large mileage of slag-surfaced secondary highways. Within recent years the mileage of concrete roads has been rapidly extended in the interests of farmers by laying 9-foot widths in the rural sections where traffic is not heavy and supplementing the 9-foot strips with slag shoulders of sufficient width to allow 2-way traffic.

The county has a well-developed system of telephone communication and is well supplied with churches and elementary and secondary schools. At Chestertown is located Washington College which not only has the distinction of being the oldest college in Maryland but which numbers George Washington as one of the contributors to its endowment. It is well attended and draws students not only from Maryland but from other States.

The industries of Kent County are related either to agriculture or to fisheries. There are two fertilizer factories at Chestertown. In addition to canneries located at Chestertown, Fairlee, Millington, Massey, Golts, and Rock Hall and on the bank of Chester River north of Crumpton, a factory at Betterton is making tomato ketchup. Flour mills are located at Chestertown and Millington. Milk-cooling stations are located at Chestertown, Kennedyville, Massey, Worton, and Blacks. A large quantity of milk is shipped to Philadelphia and New York.

Rock Hall, in season, ships large quantities of fish, crabs, and oysters to northern markets. The approximate values of the catch of oysters, fish, crabs, and muskrats is \$75,000, \$42,000, \$37,000, and \$15,000, respectively, in a single season. In Chester River, Maryland has its most valuable oyster bed which is worked jointly by citizens of Kent and Queen Annes Counties. The value of waterfowl to the county is difficult to appraise, as, in addition to the number of ducks killed, some estimate should be made of the effect of the construction of duck blinds in increasing the value of adjoining real estate.

CLIMATE

The climate of Kent County is oceanic. Chesapeake Bay borders the county on the west and the Atlantic Ocean is not far distant on the east. The summers are never extremely hot and are sufficiently long to mature all crops common to this region.

Table 1, compiled from records of the Weather Bureau, gives the normal monthly, seasonal, and annual temperature and precipitation at Coleman which is near the bay in the northwestern part of the county.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Coleman, Kent County, Md.*

[Elevation, 80 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1925)	Total amount for the wettest year (1919)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	35.9	69	—3	3.76	1.32	3.93	4.7
January.....	33.3	72	—6	3.45	4.45	4.48	6.0
February.....	33.2	69	—10	3.07	1.54	2.72	6.3
Winter.....	34.1	72	—10	10.28	7.31	11.13	17.0
March.....	43.9	87	15	3.64	2.01	4.84	4.6
April.....	53.4	90	22	3.53	2.38	4.19	.6
May.....	63.6	94	35	3.38	1.98	6.46	0
Spring.....	53.6	94	15	10.55	6.37	15.49	5.2
June.....	71.9	98	45	3.65	1.47	3.80	0
July.....	76.6	104	54	4.62	6.40	11.24	0
August.....	74.4	106	52	4.51	1.43	6.94	0
Summer.....	74.3	106	45	12.78	9.30	21.98	0
September.....	69.2	95	37	3.41	1.23	2.29	0
October.....	58.3	90	29	2.81	3.76	2.47	(1) .9
November.....	46.2	76	18	2.52	2.34	4.08	
Fall.....	57.9	95	18	8.74	7.33	8.84	.9
Year.....	55.0	106	—10	42.35	30.31	57.44	23.1

1 Trace.

The average date of the last killing frost is April 12, and the average date of the first is October 28, giving an average frost-free season of about 200 days. However, frost has been recorded as late as May 12 and as early as October 11.

The mean annual rainfall of 42.35 inches is rather evenly distributed throughout the year. The heavier rainfall is usually in July and the lightest in November. About 23 inches of rain falls between the first of March and the last of August, or during the main part of the growing season. This amount is sufficient for satisfactory crop yields. In 1930 a drought, affecting numerous States, damaged crops in Kent County from 50 to 75 per cent.

The average annual snowfall amounts to 23.1 inches, the greater part of which falls during January and February. These are the coldest months, and the ground is frozen most of the time. Such a condition is good for winter wheat and also good for the soil, because it prevents the leaching out of plant food and erosion of the surface soil during that time. Very little outdoor farm work, other than that connected with dairying, is carried on during the winter.

The climate, as a whole, favors the production of wheat, corn, and hay, as well as asparagus, sweet corn, tomatoes, English peas for canning, and special crops, such as cantaloupes, cucumbers, and many different vegetables. Cattle are grazed from the last of March until the middle of November.

AGRICULTURE

Kent County is not only one of the oldest, but one of the best agricultural counties in the State. The products of the farm have been the main source of income since the land was cleared of its forest growth. In colonial days, tobacco was an important crop in Kent and in neighboring counties, but none has been grown in recent years. Tobacco was at one time used as currency in payment of wages, debts, and taxes. In the agricultural development of the county corn and wheat have been the large and important crops, and in the last few decades hay has become a very important crop. In 1880, there were 1,500,000 peach trees in Kent County, but to-day there are very few. The decline has been due to the ravages of the diseases, blight and yellows.

Table 2 gives data for the principal crops grown in Kent County in stated years.

TABLE 2.—*Acreage and production of the principal crops in Kent County, Md., in stated years*

Crop	1879		1889		1899		1909		1919		1929	
	<i>Acres</i>	<i>Bush.</i>	<i>Acres</i>	<i>Bush.</i>	<i>Acres</i>	<i>Bush.</i>	<i>Acres</i>	<i>Bush.</i>	<i>Acres</i>	<i>Bush.</i>	<i>Acres</i>	<i>Bush.</i>
Corn.....	29,937	800,005	27,731	788,958	29,376	982,350	27,786	692,567	26,895	740,296	18,743	396,154
Wheat.....	37,581	556,947	33,754	682,424	42,373	817,120	43,199	729,305	43,966	507,777	38,109	722,793
Oats.....	1,388	19,503	1,205	18,257	325	4,770	1,026	17,503	452	6,588	819	17,562
Potatoes.....	16,734	476	39,965	378	20,716	681	60,476	486	47,584	22	1,941	
Sweetpotatoes.....	60	3,500	69	4,640	56	3,021	71	5,610				
Hay, total.....	6,410	<i>Tons</i> 6,341	17,108	<i>Tons</i> 18,923	8,579	<i>Tons</i> 6,496	10,580	<i>Tons</i> 3,260	11,119	<i>Tons</i> 3,834	11,558	<i>Tons</i> 1,798
Timothy alone.....												
Timothy and clover mixed.....							5,771	5,723	6,899	7,617		
Clover alone.....					4,751	3,383	889	762	887	552		
Alfalfa.....					33	56	296	562	1,002	2,048	1,447	2,577

The table shows that, over a period of 40 years (1879–1919), there was but slight change in the acreage of corn and wheat. These have always been the staple crops, and the increase in acreage devoted to agricultural products has been chiefly in hay crops. In the last 35 or 40 years the land has increased in productiveness through careful crop rotation, the use of lime, and the addition of large quantities of barnyard manure. The keeping of dairy cattle has made it necessary to produce more hay crops. As the soils have been in hay crops and as large quantities of manure have been added from time to time, their productivity has increased. This is particularly noticeable in the yields of wheat within the last few years.

Since 1900, there has been a steady increase in the acreage devoted to the production of hay crops, mainly timothy and clover and clover alone. In 1919, dairy products, excluding those used on the farm, were valued at \$586,425, which was an increase of more than 500 per cent of the value in 1909.

The production of apples has decreased within the last few years. Pears began to displace peaches about 1900, and the maximum number of trees was probably obtained between 1900 and 1910, but the number has decreased perhaps more than 50 per cent at the present time.

About 25 years ago, tomatoes became an important crop, and they are still one of the main canning crops. Asparagus has assumed considerable importance in the county. In 1929, there were 712 acres devoted to this crop, which is more than one-third of the acreage in asparagus for the entire State. Tomatoes were planted on 4,391 acres in 1929. Sweet corn and English peas for canning purposes are also important money crops grown by some farmers.

The number of livestock on farms, April 1, 1930, by classes, was as follows: 4,940 horses, 727 mules, 11,655 cattle, 15,672 sheep, 7,958 swine, and 82,759 chickens. The number of horses and mules on Kent County farms has been decreasing in recent years, owing largely to the increased use of tractors and trucks.

Table 3 gives the value of agricultural products in Kent County in 1929.

TABLE 3.—*Value of agricultural products in Kent County, Md., in 1929*

Crop	Value	Livestock and products	Value
Cereals.....	\$1, 229, 340	Domestic animals.....	\$1, 731, 862
Other grains and seeds.....	2, 798	Dairy products.....	752, 012
Hay and forage.....	202, 555	Wool.....	15, 111
Vegetables (including all potatoes and sweetpotatoes).....	610, 362	Poultry.....	353, 706
Fruits and nuts.....	31, 929	Eggs.....	185, 241
		Honey.....	1, 592
Total.....	2, 076, 984	Total.....	3, 039, 524
		Total agricultural products.....	5, 116, 508

In 1929, \$223,368 was expended for fertilizers and lime. The fertilizer formulas in general use are 5-8-5¹ for asparagus, 2-8-5 for tomatoes, and 1-9-4 for corn. Fall applications of fertilizer are most commonly applied to wheat. The rates of fertilizer applications range from 200 to 400 pounds an acre for wheat and corn and from 500 to 1,000 pounds for tomatoes and asparagus. Lime is applied by some farmers about every fifth year but less frequently as a general rule. Corn often receives an application of manure in lieu of fertilizer, although some farmers use about 300 pounds of superphosphate alone for wheat and corn. Most of the fertilizers used are bought ready mixed.

Most of the labor on Kent County farms, except during special seasons, as at the time of wheat harvesting and threshing, or at corn harvesting and husking, is performed by members of the farmer's family and is not evaluated on a money basis. In 1929, \$510,971 was expended in cash for farm labor in the county. The total number of farms reporting an expenditure for labor was 733, or 75.5 per cent of the total number of farms in the county. The average cost a farm reporting was \$697.10. The average daily wage for labor without board is about \$2.50.

The total number of farms in Kent County on January 1, 1930, was 971, with a total acreage of 159,460 acres, or an average of 164.2 acres a farm. Sixty-four per cent of the farms range from 100 to 500 acres in size.

¹ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

The farm acreage of the county has decreased somewhat in recent years, owing to a factor that operates generally throughout the country, namely, a decrease in prices for agricultural products disproportionate to the cost of production. Another factor, peculiar to counties with a long protected coast line, is the tendency to combine farms with water frontage to form fairly large estates, with the result that part of such land is being withdrawn from agricultural usage.

Of the 971 farms in Kent County, 48.6 per cent are operated by owners, 46.8 per cent by tenants, and 4.6 per cent by managers. About 84 per cent of the tenants furnish part of or all the farm animals and farm machinery and receive half of such crops as corn, wheat, and tomatoes and all the livestock products. The landlord usually pays for the seed, fertilizer, and lime. So far as the landlord is concerned this method of tenancy is very undesirable. He is interested in maintaining the fertility of his land to a sufficient extent to provide lime and fertilizer, and, although he realizes the value of dairying for land improvement, the system of making expenditures for which he will receive no financial return seems economically unjustifiable. As there is a deficiency in the number of reliable tenants available, this condition will compel the owner to improve his land at his own expense or allow it to remain idle. The financial pressure on some landowners may force them to the latter extremity.

The farmers of Kent County are well supplied with farm machinery, including harvesters, cultivators, haymaking machinery, manure spreaders, threshing machines, and some tractors.

The farm buildings, as a rule, consist of good 2-story dwellings, excellent dairy barns (entirely modern in equipment), and good barns and shelters for general farming purposes. Such buildings are common on farms composed of Sassafras silt loam and associated soils. On some farms consisting of the poorly drained or more sandy soils, the buildings are less pretentious and do not indicate prosperity.

The agricultural industries in Kent County consist mainly of dairying and of canning special crops. Dairying is the main agricultural pursuit of the farmers of the county, and the average production of milk a cow and the total quantity of milk produced exceeds that of any other Maryland county situated on the Eastern Shore. Both the climate and the prevailing heavy types of well-drained soils make the county well suited to the production of hay and grain crops. Most of the hay and some of the grain produced is fed to the dairy cows, and the milk and cream are sold. In this way a farmer receives a greater return for his products and at the same time is enabled to improve his land by the application of barnyard manure. Milk production has been increased by introducing better breeds of dairy cows, by better feeding and care of the animals, and by the use of legumes in the ration.

The canning of tomatoes, sweet corn, and English peas is an important industry. By canning these crops the farmers realize more revenue from the land than if the crops were sold green or if staple crops were produced on the same land.

Many large flocks of turkeys are raised, some of them comprising 2,000 or more birds. They are separated into small groups by high fences. The turkeys are fed a large quantity of grain, and under normal economic conditions more can be realized from the sale of turkeys than would have been obtained from the sale of the grain.

SOILS AND CROPS

Nearly 90 per cent of Kent County is in farm land, and of this, nearly 80 per cent is either under cultivation or in pasture. The unused land consists principally of the flat, poorly drained areas in the eastern end of the county, rough hilly land along Sassafras and Chester Rivers and their larger tributaries, and some flat, poorly drained land in the extreme southern, or foreland, part of the county. Some of the poorly drained areas are used for grazing purposes.

Most of the unused land supports a second growth of timber consisting mainly of hardwoods. White, black, chestnut, and red oaks, together with some hickory, black gum, sweetgum, white elm, black locust, scrub pine, loblolly pine, and a few sassafras and dogwood, constitute the principal tree growth. Many of these trees also grow on the Keyport soils, and in addition white oak, Spanish oak, and tulip poplar are noticeable. On the Elkton and Portsmouth soils, or the poorly drained soils of the county, white, Spanish, and other oaks, beech, black gum, sweetgum, red maple, and loblolly pine comprise the main tree growth. Scattered over the county the herbaceous vegetation includes goldenrod, aster, panic grass, sorrel, partridge pea, bush clover, sedge grass, and other coarse grasses and weeds.

Practically all the merchantable timber in Kent County has been cut and most of the trees here, with the exception of some of the oaks, are second-growth trees.

Kent County, compared with other counties on the Eastern Shore, has an unusually high percentage of its area occupied by well-drained and heavy-textured, mainly silt loam, soils. This difference in soils tends to distinguish it from the neighboring counties as shown by the fact that although smaller in area it leads all the Eastern Shore counties of Maryland in total pounds of milk produced annually, owing to the heavy stands of hay and pasture grasses produced on these soils. It also ranks high as a producer of corn, wheat, and hay.

Dairying is the main agricultural pursuit and furnishes the principal cash income of the farmers. The extensive areas of Sassafras silt loam, which is a brown silt loam, mellow, friable, and well drained throughout, covers the greater part of the county. This soil, under the favorable climate giving a long season for grazing, is not only well adapted to the production of staple crops but to the production of pasture grasses for hay and grazing. The value of dairy products sold annually is between \$600,000 and \$700,000. The regular income derived from the sale of milk and cream supplies the farmers with ready cash throughout the year. One of the important factors in regard to dairying is the fact that Kent County is only about 70 miles distant from the Philadelphia market, and good rail transportation, together with the use of trucks, brings this market within a few hours of the area of production. Therefore, the soil suitable for the production of hay, corn, and other staple crops, the favorable climatic features, and the readily accessible markets combine to make Kent County one of the important counties in the State in the production of dairy products.

A large cash revenue is derived from the sale of tomatoes and sweet corn, together with some asparagus, peas, and other truck crops. Chicken and turkey raising, in addition to the feeding of hogs and sheep, are of considerable importance on many farms and are very generally practiced on some of the better farms.

The farmers have apparently worked out a system of agriculture that fits especially well with the soils and climate of Kent County. The markets have been an important factor in the development of the dairy industry and also figure to a considerable extent in the growing of tomatoes and sweet corn as canning crops and in the production of truck crops.

In Kent County a direct relationship exists in many places between the agriculture and the various soil types. From the viewpoint of agriculture as well as that of the soil, the soils of the county naturally fall into the following three main groups: (1) Brown well-drained soils, (2) light-gray poorly drained soils, and (3) black poorly drained soils.

In the following pages of this report the soils of Kent County are described in detail, and their agricultural importance is discussed; their distribution is shown on the accompanying soil map; and Table 4 gives their acreage and proportionate extent.

TABLE 4.—*Acreage and proportionate extent of soils mapped in Kent County, Md.*

Type of soil	Acres	Per cent	Type of soil	Acres	Per cent
Sassafras silt loam.....	79,040	43.8	Elkton silt loam.....	12,608	7.0
Sassafras silt loam, steep phase.....	8,704	4.8	Elkton loam.....	2,048	1.1
Sassafras loam.....	7,488	4.2	Portsmouth loam.....	448	.2
Sassafras loam, mixed phase.....	12,608	7.0	Meadow.....	7,360	4.1
Sassafras sandy loam.....	6,400	3.5	Tidal marsh.....	7,104	4.0
Sassafras loamy sand.....	2,944	1.6	Coastal beach.....	192	.1
Keyport silt loam.....	29,952	16.6	Total.....	180,480	-----
Keyport loam.....	2,816	1.6			
Keyport sandy loam.....	768	.4			

BROWN WELL-DRAINED SOILS

The group of brown well-drained soils includes all the soils of the Sassafras and Keyport series mapped in Kent County. These soils cover 150,720 acres, or by far the greater part of the county. They dominate the agriculture and produce the greater part of the corn, wheat, hay, and dairy products, as well as tomatoes, sweet corn, asparagus, and other truck crops.

These soils occur in the northern, central, and western parts of the county and also have a general distribution elsewhere. The surface features comprise almost level, undulating, or gently rolling areas which become rolling, broken, and steep near the rivers and larger estuaries. Nearly all the land lies favorably for the use of improved farm machinery. The soils are naturally well drained in the surface soil, and underlying the subsoil at a depth ranging from 30 to 40 inches is a sandy or gravelly substratum which allows good drainage in the lower part of the subsoil.

The soils of this group are light brown, grayish brown, or brown to a depth ranging from about 6 to 12 inches, and they are underlain by brown, yellowish-brown, or reddish-brown subsoils. The texture of the surface soils ranges from sand to silt loam, the latter being the dominant texture. The soils are very friable, mellow, and easy to till. The subsoils are sands, sandy clays, clay loams, or silty clay loams. In some of the Keyport soils and in some areas of Sassafras loam, mixed phase, the subsoil is heavy blue or grayish-white clay.

The subsoils of all the soils, except the sands, are retentive of moisture. They represent the heaviest layer in the profile and are the seat of the greatest amount of plant food.

The physical properties of these soils are such that they respond well to the application of manures and fertilizers and also to the turning under of green-manure crops. A rather larger quantity of manure is annually applied to the land, particularly to soils in the dairy region, and this, together with the rotation of crops, has gradually improved the productivity of these soils which are considered the best in the Eastern Shore of Maryland. They are adapted to a wide range of crops, and yields are satisfactory under ordinary climatic conditions. On these soils, particularly the heavier types, are located the most prosperous farmers of the region. Large farmhouses, neatly painted, and large modern barns and improved farm machinery are characteristic of the greater part of the county.

The Keyport soils of this group occupy an intermediate position between the well-drained Sassafras soils and the poorly drained Elkton soils. Generally speaking, the Keyport soils are not so desirable for all farming purposes, particularly for truck crops, as the Sassafras soils. Their agricultural value, however, more closely approximates that of the Sassafras soils than of the Elkton.

Sassafras silt loam.—The surface soil of Sassafras silt loam in cultivated fields ranges in color from light brown or grayish brown to brown and in depth from about 6 to 10 inches. It is mellow and friable and under normal moisture conditions is easy to till. The subsoil to a depth of 36 or 40 inches is reddish-brown or yellowish-brown silty clay loam or silty clay. This material breaks easily into irregular-shaped lumps which crumble to a friable mass. Below the subsoil is light-brown or brownish-yellow fine sandy loam which in places contains some small rounded gravel.

In a few of the slight depressions where material from the higher-lying areas has been washed in and has accumulated, the surface soil is darker brown and in many places extends to a depth of 15 or 18 inches. In other places, as in some of the more rolling areas where erosion has been active, the surface soil is only a few inches thick. Near some of the streams in the eastern and western parts of the county and along some of the necks of land projecting into Chesapeake Bay, spots of sandy loam or loamy sand texture are included with Sassafras silt loam in mapping. East of Langford and Lynch are a few spots of loam texture and also a few in which gravel and iron concretions occur in the surface soil. Such an area, in which a few cobblestones are present, lies near the headwaters of Fairlee Creek.

In some of the road cuts, particularly to the north of Chestertown and near Kennedyville, Sandy Bottom, Hanesville, Stillpond, and Galena, the lower part of the subsoil has a greenish-brown cast and other characteristics somewhat similar to the subsoil of the Collington soils developed in Queen Annes and Prince Georges Counties. These areas are included with mapped areas of Sassafras silt loam because of their small extent.

In the northwestern part of the county, particularly to the west of Smithville and in a few other places, are a few small areas, occupying the higher flats, which approach Leonardtown silt loam in their characteristics; that is, the surface soil is grayish-yellow or grayish-white silt loam and the subsoil is brownish-yellow silty clay which is under-

lain at a depth ranging from 15 to 24 inches by a mottled light-gray, yellow, or brown hard compact layer. Owing to their small extent, these areas were not separated from Sassafras silt loam on the map.

Sassafras silt loam is by far the most extensive and most important agricultural soil in Kent County. It covers 123.5 square miles, or 79,040 acres, which is approximately 44 per cent of the land area of the county. It is the principal soil throughout the northern half and is also well developed in the central-western part. It occurs as broad continuous and unbroken areas in the vicinity of Sassafras, Galena, Blacks, thence south to Chester River, in the vicinity of Morgnec, around Kennedyville, Stillpond, Bigwoods, Smithville, north of Chestertown, north of Langford, and in the vicinity of Fairlee.

Sassafras silt loam contains a larger supply of available plant food than any other Sassafras soil. Both the texture and structure of the subsoil are such as to make it retentive of moisture and capable of holding commercial fertilizers and stable manure. Crops may not respond so quickly to fertilizers on this soil as they would on some of the lighter-textured soils, but the plants will gradually obtain the soluble plant-food materials during the growing season. The silt loam requires more power for cultivation, dries out more slowly after rainy seasons, and warms up a little later in the spring than the more sandy soils.

Sassafras silt loam is the strongest and one of the most productive soils of the county. Perhaps 95 per cent or more of the land is under cultivation or is used as pasture in rotation with the cultivated areas. The principal crops grown are wheat, corn, and hay. Yields of wheat range from 20 to 35 bushels an acre; of corn, from 30 to 60 bushels; and of hay, about 2 tons. High yields of sweet corn are obtained, and asparagus and other truck crops do well. Where red clover is grown, this soil in most places requires about 1,000 pounds of ground limestone an acre to correct the acidity.

Sassafras silt loam, steep phase.—Sassafras silt loam, steep phase, includes all areas of Sassafras silt loam which are too steep for economic cultivation, and most of the land is more or less gravelly. It occurs in narrow strips throughout the northern, northwestern, and western parts of the county. Some of the largest areas are northeast of Sandy Bottom, west, north, and northeast of Stillpond, and along the various tidal creeks and estuaries of Sassafras River.

Sassafras silt loam, steep phase, differs essentially from Sassafras silt loam in that it occupies the steep broken slopes that are more or less gullied and eroded. It also differs in that both the surface soil and subsoil are not uniform in texture, structure, or color. The surface soil ranges from silt loam to sandy loam or even loamy sand, and the subsoil ranges from loamy sand to silty clay loam. Many small rounded gravel are present in some places, usually occurring in horizontal bands ranging from 100 to 200 feet in width. Erosion and other agencies have spread the gravel over the surface of the underlying layer. There are spots of typical gravelly loam, and the more gravelly areas are indicated on the map by gravel symbols. Near Fairlee some spots of gravelly sand contain small cobblestones.

Sassafras silt loam, steep phase, where cleared, is used mainly for pasture land. Small areas are farmed, and some are devoted to the production of fruit. Most of the land is forested, mainly to hard-

woods and some pine. The cultivated areas return fair yields, but, owing to the steepness of slope and to the susceptibility of the land to washing and erosion if not protected by terraces, this soil must be handled with care. Most of the land should be devoted to pasture and the steeper slopes to forestry.

Sassafras loam.—The surface soil of Sassafras loam differs mainly from Sassafras silt loam in the texture and structure of both the surface soil and subsoil. The surface soil contains enough sand and silt and other fine materials to give it a loamy feel and friable consistence. The subsoil is reddish-brown friable clay, in most places extending to a depth ranging from 30 to 40 inches. It is underlain by lighter-colored and more friable material.

Included with this soil in places are spots of Sassafras fine sandy loam, Sassafras loamy fine sand, and small areas of Keyport loam. Between Worton and Lynch the loam includes some sandy loam and loamy sand, and near Fairlee Creek it contains some gravel and cobblestones. About 3 miles south of Golts, the Sassafras loam areas include spots of Sassafras silt loam, Sassafras sandy loam, Keyport silt loam, and Elkton loam.

The surface relief of Sassafras loam is slightly more rolling than that of Sassafras silt loam and this, together with the more sandy texture and openness of both surface soil and subsoil, insures excellent natural surface and internal drainage for all areas. The soil naturally warms up a little quicker in the spring and is slightly easier to cultivate than Sassafras silt loam.

Sassafras loam is one of the less extensive soils of Kent County. The largest areas are east and south of Massey. An area lies in the extreme northern end of the county, a medium-sized body is south of Swan Creek, an area is south of Chestertown, and a few small bodies are scattered here and there throughout the county.

In crop adaptation and usage, this soil has about the same value as Sassafras silt loam, but it is slightly better adapted to growing truck crops. It requires liming for the successful production of red clover or alfalfa. On the dairy farms, a large quantity of barnyard manure is applied to the soil. In general, Sassafras loam is handled in the same way and produces yields very similar to those obtained on Sassafras silt loam.

Sassafras loam, mixed phase.—Sassafras loam, mixed phase, differs essentially from Sassafras loam in that there is no uniformity in the texture or structure of either the surface soil or subsoil. On an average-sized farm, this mixed soil includes areas of Sassafras loam, Sassafras fine sandy loam, and Keyport loam so intricately mixed that no separation could be made on a small-scale map. The surface soils are dominantly brown or light brown on the more rolling areas and range from loamy fine sand to sandy loam in texture. On the flatter areas and in the depressions, the surface soil is light gray and dominantly silty and the subsoil is in most places mottled gray and rust-brown heavy clay loam or clay. On the more rolling areas, especially the typical Sassafras loam spots, the subsoil is reddish-brown friable clay or silty clay. In some places this character of subsoil, at a depth of about 2 feet, passes into gray or gray and yellow silty clay.

This mixed soil occupies gently rolling or rolling areas, with slight depressions and intervening basinlike areas. All the land, with the exception of the depressions, is naturally well drained.

Sassafras loam, mixed phase, covers a total area of 12,608 acres. Practically all of it lies in the southwestern neck and the western side of the county. The largest areas are at Eastern Neck, near the mouth of Langford Bay, along Chester River south of Chestertown, and between Handys Point and Melitota. Small strips are mapped to the north of Chester River and along Morgan Creek.

Sassafras loam, mixed phase, owing to its somewhat irregular surface relief, which affects to some extent the drainage of the soils, and also to the mixed soil condition, taken as a whole is not so productive as Sassafras loam. Soil of the mixed phase, however, is more productive or is used to greater extent, perhaps, than is Keyport loam. The main agricultural pursuit on this soil is the production of corn and pasture grasses. The lighter-textured or more sandy surface soil areas, most of which occur on the ridges and knolls, are well suited to the production of asparagus and other truck crops. On some of the more poorly drained areas, pasture grasses and hay crops give the best returns. In a few eroded areas, practically all the surface soil has been removed, and the heavier material is exposed. Such areas are of lower productivity than the average areas of this mixed soil. Some good farms are located on this soil, and fair yields of corn, wheat, and hay are obtained.

Sassafras sandy loam.—The surface soil of Sassafras sandy loam in cultivated fields is grayish-brown or light-brown light sandy loam to a depth of about 6 or 8 inches. It is mellow and friable, and a good tilth is easily obtained. Below this is a subsurface layer of brownish-yellow or light-brown sandy loam which continues to a depth ranging from 12 to 20 inches. The subsoil to a depth ranging from 28 to 34 inches is reddish-brown friable clay or heavy friable sandy clay which grades into yellowish-brown or brownish-yellow loamy sand or light sandy material, in places containing some coarse sand and gravel. The subsoil is deeper red than either the subsoil of the silt loam or loam members of the Sassafras series. It is not so heavy in texture or compact in structure as the silt loam, but it is sufficiently heavy to retain moisture well and to hold the plant foods (fertilizers and manures).

Included with this soil in mapping are small spots of loamy sand or sand texture, also spots of Keyport sandy loam. To the east of Millington are a few flats or slight depressions included with the sandy loam which are more nearly representative of Elkton sandy loam.

Sassafras sandy loam is one of the less extensive soils of the county, and it occurs for the most part in the eastern end. The largest areas are east and northeast of Millington, and smaller bodies lie between Millington and Chestertown and to the south of Chestertown. A few fair-sized areas occur in the extreme northwestern part at Plum Point and Rocky Point, to the east of Betterton, and on the south side of Sassafras River to the east and west of Georgetown. All areas of this soil, including the slight depressions, are well drained.

This soil warms up quickly in the spring and is very easy to till. About 80 per cent of the land is cultivated, and, where manured or heavily fertilized, fair yields of the staple crops are obtained. This soil is not so well suited for the growing of grain and hay crops as is Sassafras silt loam, and it is not so well suited to dairying as are the

heavier soils of the county. It is well suited to the production of cantaloupes and other truck crops. Sweetpotatoes, melons, and peaches do well.

Sassafras loamy sand.—Sassafras loamy sand is scattered in small areas in the southeastern part of the county along Chester River, in the northwestern part near Chesapeake Bay, and in Eastern Neck. It is one of the small and unimportant soil types. It occupies undulating or gently rolling areas and is exceptionally well drained.

This soil consists of grayish-brown or light-brown loamy sand to a depth ranging from 8 to 12 inches. This material grades into brown or slightly reddish brown loamy sand which continues to a depth of about 20 inches, where it is underlain by light reddish-brown loamy sand or light sandy loam, extending to a depth ranging from 28 to 34 inches. In most places below this depth, the color is brownish yellow and the material is loamy sand or sand.

Included with Sassafras loamy sand are small areas of Sassafras sand, particularly on the western banks of Cypress Branch, on the banks of Chester River, and locally at Worton Neck. Included spots of Sassafras sandy loam occur to the south of Kennedyville in the vicinity of Morgan Creek, and spots of Keyport loamy fine sand are included in Eastern Neck Island.

Probably not more than 20 per cent of this soil is under cultivation. It is well suited to the production of early truck crops, watermelons, cantaloupes, sweetpotatoes, tomatoes, and peaches. Some corn is grown, and fair yields are obtained where the soil has been manured or fertilized. In the western part of the county on some of the highest elevations in close proximity to Chesapeake Bay, the land is so steep that erosion has been destructive. Some of this soil is too hilly for cultivation and should be used only for forestry.

Keyport silt loam.—The surface soil of Keyport silt loam consists of grayish-yellow or light-brown silt loam to a depth ranging from 6 to 10 inches. It is mellow and friable, and a good tilth is easily obtained under favorable moisture conditions. The subsoil is brownish-yellow or yellowish-brown smooth, but friable, heavy silt loam or silty clay loam, which extends to a depth ranging from 15 to 22 inches below the surface. It is underlain by mottled brown, yellow, and gray silty clay continuing to a depth ranging from 30 to 38 inches. This layer is underlain by a substratum of gray or grayish-yellow fine sandy material.

To the south of Galena, about $1\frac{1}{2}$ miles northeast of Bigwoods, and 2 miles northeast of Chestertown, are small included areas which appear to be eroded Sassafras silt loam. The subsoil in such places consists of gray or gray and mottled brown and yellow tenacious clay, heavier than the typical subsoil of Keyport silt loam. On Eastern Neck in the southwestern part of the county the surface soil is deeper and the subsoil in places is more like that of Sassafras silt loam. On some of the flat forelands, especially to the east of Edesville, the surface soil is grayish brown or light colored, and here it was difficult to distinguish Keyport silt loam from Elkton silt loam.

Occurring in association with the Sassafras soils Keyport silt loam in most places is darker brown than in areas associated with the Elkton soils, and the subsoil in such areas is usually more brown and more friable. Included with Keyport silt loam is a small knoll of

Sassafras fine sandy loam about one-third mile southeast of Rock Hall. In many places Keyport silt loam and Elkton silt loam are closely associated in occurrence and no sharp line of demarcation could be drawn between these soils. To the south of Galena, an area of Keyport silt loam resembles eroded Sassafras silt loam.

Keyport silt loam is the second largest soil type in Kent County, covering 46.8 square miles, or 29,952 acres. The largest areas are developed in the southwestern part of the county, immediately south of the Sassafras silt loam belt, and in the vicinity of Edesville, Sandy Bottom, and Pomona. Large areas are developed in the northwestern part, around Newtown, to the west of Melitota, north and south of Worton, and in the eastern end of the county to the east of Chesterville and to the west and southwest of Massey. Smaller bodies occur at Chestertown, at Morgnec, and along the Delaware State line.

Keyport silt loam is by far the most extensive Keyport soil in Kent County. About 80 per cent of its total area is cultivated or used for pasture. In favorable seasons yields of corn, wheat, and hay on this soil compare favorably with those on Sassafras silt loam, but the yields are affected more adversely by abnormally wet seasons during the growing period. The lime requirement is greater than for Sassafras silt loam. This soil warms up later in the spring than the Sassafras soils, consequently the growing period for the crops is shorter.

Keyport loam.—The surface soil of Keyport loam is light-brown or grayish-yellow loam to a depth ranging from 6 to 10 inches. The upper part of the subsoil is yellowish-brown or brownish-yellow friable clay which is underlain by mottled brown, gray, and yellow rather heavy clay at a depth of about 15 or 18 inches. This material extends to a depth ranging from 30 to 40 inches, where lighter-colored and more sandy material is present. Keyport loam may be considered an intermediate soil, in texture and structure of both surface soil and subsoil, between Keyport silt loam and Keyport sandy loam.

Keyport loam is one of the inextensive soils of the county. The largest areas are in the extreme southern end of Eastern Neck, and small bodies lie on Quaker Neck southwest of Pomona. Fair-sized areas are developed in the extreme eastern end of the county near the Delaware State line, north and south of Golts. The areas are level or gently undulating, and natural surface drainage is slightly better than on the broader smoother areas of Keyport silt loam. Because it is lighter in texture, this soil should warm up earlier in spring than Keyport silt loam and it should be cultivated with greater ease.

Perhaps not more than 70 per cent of the total area of this soil is under cultivation. It is devoted to the production of the staple crops and locally to truck crops. Yields on Keyport loam are in general less than those on Sassafras loam under similar manure and fertilizer treatments.

Keyport sandy loam.—The 8 to 12 inch surface soil of Keyport sandy loam is grayish-yellow or light-brown sandy loam, and the subsoil begins as pale-yellow or brownish-yellow heavy sandy loam which, within a few inches, passes into mottled brown, yellow, and gray friable clay or heavy clay. In most places this layer is underlain at a depth ranging from about 30 to 40 inches by light sandy material. Included with this soil in mapping are small areas which are light textured to a depth ranging from 2 to 3 feet.

Keyport sandy loam is one of the inextensive soils of the county, and it occurs in the extreme eastern end near the Delaware State line, where it is closely associated with the Elkton and Sassafras soils. The surface soil is very easy to till and, where well drained, warms up quickly in the spring. This is not quite so productive a soil as Keyport silt loam and Keyport loam and it is not so well suited to the production of hay crops. Corn, tomatoes, sweet corn, and some other truck crops do well where the land has been manured or heavily fertilized.

LIGHT-GRAY POORLY DRAINED SOILS

The light-gray poorly drained soils in Kent County include only Elkton silt loam and Elkton loam. These soils occur mainly on the flat forelands which in general lie at only a slight elevation above tidewater, and they also occupy smaller areas intermingled with other soils in the higher parts of the county. All the Elkton soils have a flat almost level surface, and where they occur in association with the Sassafras soils they usually occupy the slight depressions and flat areas. Natural surface drainage of these soils is poor, owing to their flat surface and to the heavy character of the subsoils. Artificial drainage is necessary to reclaim these poorly drained soils for agricultural purposes. This can be accomplished by means of open ditches or small canals. Owing to the heavy clay subsoil, the walls of the ditches stand up well.

The soils of this group are light colored, ranging from almost white to light gray in the surface soil, both in cultivated areas and wooded areas, except in some places where a slight accumulation of organic matter is on the surface. The subsoils are tough heavy plastic clays or heavy sandy clays, mottled light gray, rust, and rust brown, extending to a depth ranging from about 35 to 40 inches. When dry the subsoils are very hard and intractable. The material cracks and breaks into irregular lumps showing slight stratification in some places. Below this depth, the material is bluish-gray silty clay or clay loam, with light-gray and brownish-yellow mottlings. The substratum varies greatly from place to place both in color and structure. The texture ranges from fine sand to silty clay loam.

The surface soils contain a very small amount of organic matter and, owing to their dominantly silty texture, they have a tendency to puddle, or run together, when wet and to become hard and slightly stratified when dry. The mottled color of the soils is probably caused by their alternate wetting and drying. In many of the slight depressions within large flat areas, water stands on the surface for a long time during rainy seasons, as it runs off very slowly and also penetrates the heavy subsoil slowly.

The Elkton soils require stronger work animals and heavier machinery than do the lighter-textured soils of the county. They are naturally acid and require from 1,000 to 3,000 pounds of lime an acre to correct the acidity. They respond readily to applications of lime and barnyard manure and to the turning under of green-manure crops. The barnyard manure and green-manure crops not only supply the needed nitrogen but, together with the lime, improve the physical properties of the soil, rendering it more loamy and allowing it to take up more rain water and to retain a larger amount of it. Chemical analyses show that the Elkton soils compare favorably with

the Sassafras and Keyport soils in respect to total content of plant food. Therefore the production of crops and successful farming on the Elkton soils are dependent on adequate drainage, the addition of organic matter or manures, and the application of a liberal quantity of lime.

The percentage of these soils under cultivation is comparatively low. The greater part of the land is in woodland, and the forest growth consists of a second growth of white, Spanish, and black oaks, black gum, sweetgum, and some holly, together with an undergrowth of myrtle and huckleberry. A large acreage is in permanent pasture.

Elkton silt loam.—The surface soil of Elkton silt loam, locally known as "white oak land," consists of light-gray or grayish-white silt loam to a depth of 8 or 10 inches. It is smooth and has a flour-like feel. In some places in forested areas a thin covering of leaf mold or leaves lies on the surface. The subsoil is bluish-gray, mottled with yellowish brown or rust brown, silty clay loam or clay, extending to a depth ranging from 35 to 40 inches. The subsoil is plastic and sticky when wet, but it becomes hard and brittle and cracks on drying. It grades into light-gray silty clay loam, slightly mottled with light gray and brownish yellow. The subsurface material varies considerably from place to place in color and structure, and it ranges in texture from fine sandy clay to clay. West of Sandy Bottom are several small areas, in which the surface soil to a depth of a few inches is darker than typical, owing to an accumulation of organic matter, and here a thicker vegetative growth prevails. Such spots are almost black enough in the surface layer to be classed as Portsmouth loam or Portsmouth silt loam.

Elkton silt loam is the third most extensive soil in the county. It occupies 19.7 square miles, or 12,608 acres. It is developed in the southwestern end and also in the eastern end of the county. The largest areas lie between Tolchester Beach and Sandy Bottom, to the northeast and southwest of Pomona, and to the north, south, and east of Rock Hall. A large area lies west of Massey, and a smaller one is west of Golts. A few small areas are scattered here and there throughout the western and eastern parts of the county.

Only a small percentage of Elkton silt loam is under cultivation, but a fairly large acreage is in pasture. Most of the land supports a second growth of trees. Areas which have been drained and limed produce fair yields of wheat and grass. This soil, when properly handled, is well suited to timothy. Tomatoes on a commercial scale are grown by a few farmers. In Dorchester County, large areas of Elkton silt loam are used for the production of wheat, corn, and hay, and good yields are obtained.

Elkton loam.—Elkton loam is one of the least extensive soils of the county. Practically all of it occurs in the extreme eastern end, near and bordering the Delaware State line. A few small areas are developed in the extreme southwestern part. Although Elkton loam in general occurs only in flat areas, one small spot is mapped on a gentle slope bordering the drainage way about three-fourths mile north of Hanesville. Here, the soil seems to have developed, through seepage, from the higher-lying land.

Elkton loam differs from Elkton silt loam mainly in the texture and structure of the surface soil. It contains more sand than the

silt loam, and this gives a more open and friable character to the soil. Included with this soil in mapping are small patches of Elkton sandy loam.

Elkton loam is naturally better drained than Elkton silt loam, as it is more open and friable and warms up slightly quicker after rains. It is easier to cultivate than the silt loam because of its sand content, and it does not run together so readily. The staple crops grown, the yields obtained, and the methods of fertilization and handling of this soil are similar to those on Elkton silt loam. Tomatoes are grown for canning purposes. Corn, wheat, and hay are grown to some extent.

BLACK POORLY DRAINED SOILS

The group of black poorly drained soils includes Portsmouth loam, and two miscellaneous classifications of material—meadow and tidal marsh. The total area of these soils is small, and their agricultural importance in Kent County is negligible. In color, texture, and structure, these soils are markedly different from the soils of the two groups previously described.

These soils have remained in a swampy or semiswampy condition for a long time. Vegetation has flourished, and a large amount of organic matter has accumulated to a depth of several inches. This organic matter has been preserved in a partly decomposed state as a result of a permanently excessive moisture supply. It is not incorporated in the soil as in the black lands of the West, and after a few years' cultivation a large part of it is lost.

Portsmouth loam.—The surface soil of Portsmouth loam is black loam to a depth ranging from 10 to 16 inches. It contains a large amount of organic matter and is mellow and friable. In the interior of the area, the surface soil in most places is silty in texture and it has a smooth slick feel. Bordering the sandy soils the surface soil of Portsmouth loam is in places black or dark-gray sandy loam. The subsoil is prevalingly light-gray or bluish-gray, mottled more or less with rust brown or yellow, silty clay loam or heavy sandy clay, extending to a depth ranging from 30 to 40 inches. Below this is light-gray sandy loam or light sandy material. In some places the subsoil material immediately underlying the surface soil is light-gray sandy loam or loamy sand, especially in a few places where this soil borders the sandy soils.

Portsmouth loam is one of the inextensive and unimportant soils of Kent County. Only a few areas are developed, and these occur in the eastern end of the county along the Delaware State line. The largest areas are immediately west and north of Golts and about 2 miles south of that town. The soil occurs in flat level areas or in slight depressions, in which natural drainage has not been established. None of the land can be successfully cultivated without artificial drainage. The land can be reclaimed by means of open ditches, the banks of which stand up well, owing to the heavy character of most of the subsoil.

Only a few small fields have been cleared and cultivated, and most of the land is in forest of hardwoods and gums. When drained, aerated, and limed (by using from 2,000 to 3,000 pounds of lime an acre) it will produce fair yields of corn and buckwheat. It is fairly well suited to the production of potatoes, strawberries, blueberries, and cabbage.

Meadow.—Meadow occurs in strips, ranging from 100 to 400 feet in width, along practically all the interior streams of the county. It is normally flooded during the wet seasons but is usually dry in the summer and fall. There is no uniformity in color, texture, or structure of the surface soil or of the underlying material. The soil ranges from silt loam to sandy material, and new material is continually being washed from the adjacent uplands and deposited by the streams. The land is overflowed at each heavy rain.

Part of meadow, if protected from overflow, would produce good yields of corn and hay. It is used mainly for summer pasture, and its best use is perhaps for permanent pasture. The natural tree growth includes alder, oaks, pine, black gum, and sweetgum. Myrtle bushes and sedge grasses constitute the undergrowth. Some of the meadow should remain in wood lots.

Tidal marsh.—Tidal marsh includes areas of both brackish and fresh-water marsh. The largest areas are along Chesapeake Bay, along Sassafras and Chester Rivers, and along Langford Bay. The fresh-water marshes occur only along the upper reaches of the rivers. The soil material is dark-gray or brownish-gray slimy oozy loam or silt loam, containing coarse particles of plant remains and organic matter. In places this material is underlain at a depth ranging from 15 to 20 inches by gray heavy silty clay containing some rust-brown mottlings.

Tidal marsh areas are subject to daily inundation by brackish or fresh water, and most of the areas are permanently saturated. The land supports a rank growth of salt marsh grasses, some cow lily, arrowhead, water hemp, wild rice, and cattail. It has no agricultural value at present except possibly some grazing for cattle.

MISCELLANEOUS SOIL MATERIALS

Coastal beach.—Coastal beach has been mapped in a few very narrow strips along Sassafras River and Chesapeake Bay where long sand spits have been deposited, consisting of loose light-brown or brownish-yellow fine or medium sand. This material is subject to change by tide and winds as no vegetation grows on most of it. The land has no agricultural value.

RECOMMENDATIONS FOR THE IMPROVEMENT AND MANAGEMENT OF KENT COUNTY SOILS

Many of the farmers of Kent County are apparently handling their soils to best advantage under present economic conditions. Within the last 35 or 40 years the soils have been greatly improved by rotation of crops, by liming of the soil, and by the application of large quantities of manure. The manure has been obtained as a result of the extensive dairying operations. It has been found that liming of the soil, at intervals ranging from every 5 to 10 years, has been beneficial, especially where alfalfa and some of the leguminous crops have been grown.

Throughout the greater part of the county, the rotations generally practiced are the 4 and 5 year systems. In the 4-year system the sod land is plowed under for corn which is followed by two successive crops of wheat. With the second crop of wheat, grass and clover are seeded for hay. The 5-year system differs from the 4-year system only in that the land is left in grass for two years instead of one. This

system seems to be the better of the two, especially where dairying is one of the main farming operations.

Tomatoes, sweet corn, and English peas are substituted in part in the rotation for that part of the area ordinarily devoted to corn. At the Kent County almshouse farm, about 3 miles north of Chestertown, the University of Maryland Agricultural Experiment Station had in operation a series of soil-fertility test plots on Sassafras silt loam. In a rotation of corn, wheat, hay, and potatoes, a 4-12-4 fertilizer gave satisfactory results. It appears that applications of 600 pounds of a 4-12-6 fertilizer an acre to each rotation divided between the corn and the wheat or an equal amount of a 2-12-4 fertilizer, applied in the same manner provided manure is applied, should maintain the fertility of the land in the 4-year system on the heavy soils of the Sassafras series. In the production of potatoes, tomatoes, asparagus, and other vegetables, the farmers have found that in addition to manure, a heavy application of 4-8-7 or 4-8-10 fertilizer gives the best yields. Some farmers do not use complete fertilizer on corn, especially where the land has been heavily manured, but they may apply from 200 to 400 pounds of 16 per cent superphosphate (acid phosphate) or an equal amount of 0-12-5 fertilizer.

On the heavy poorly drained soils, such as Elkton silt loam, data acquired from the results of about 10 years of experimental work on the experimental farm at Princess Anne, Md., indicate that the soil is deficient in available nitrogen, phosphorus, and potassium, so far as normal requirements for crop production are concerned. This soil apparently suffers greatly from lack of organic matter, as has been demonstrated by a marked increase in yields of the manured plots or those in which green-manure crops have been turned under. Drainage on this soil, however, determines to a large extent its productivity and may be considered the limiting factor in crop production. A prolonged rainy spell in spring may delay thorough preparation of the seed bed, planting, and subsequent tillage of the soil.

The farmers realize that practically all the Elkton and Portsmouth and some of the Keyport soils are poorly drained and that these soils, in most areas, could be reclaimed by construction of canals and ditches. Ditch banks stand up well in the heavy clay subsoil of the Elkton soils. The soils of the county should be tested for acidity at stated intervals, and lime should be applied when necessary.

Terracing on the more rolling (not forested) areas has proved beneficial in retaining the good surface soil and thus preventing gullying and wasting away of the land. Keeping such areas in grass most of the time is a good method of preserving the soil and restoring organic matter.

SOILS AND THEIR INTERPRETATION

Kent County lies in the coastal-plain region of the United States and is north of the center of the Eastern Shore peninsula. The soils belong to the brown forest soils group. The soils, although belonging to the podzolic group, are not true podzols. With the exception of a few small areas of Portsmouth loam, all the surface soils are light colored, ranging from light gray to brown.

The soils of Kent County have developed under a forest cover of hardwoods and pine intermixed, the deciduous trees predominating. This condition has not favored the accumulation of a large amount of organic matter in the soils, except in the Portsmouth soils which

have remained in a semiswampy condition for a long time and vegetation has flourished and died. In some of the forested areas there is a slight accumulation of vegetable mold, leaves, twigs, and grass roots on the surface, but, as a general rule, organic matter is not mixed with the soil to a depth of more than 2 to 4 inches.

All the soils of the county are slightly acid or acid, except where the acidity has been neutralized by liberal applications of lime. The light-colored Elkton soils and Portsmouth loam are prevailingly acid, and they require rather heavy applications of lime to neutralize the acidity.

As the rainfall in Kent County is heavy and the temperature for the greater part of the year is mild, a large amount of the soluble salts have been leached from the surface soils, particularly in the more sandy textured soils and in the soils on the steeper slopes. Erosion has been active on the more rolling areas, and in many places a noticeable quantity of soil material has accumulated at the bases of the slopes as a result of sheet erosion. In some places the finer material from the slopes and ridges has been carried away by the lateral movement of moisture in the soil, and as a result the coarser soil particles remain as sandy loam or loamy sand.

There are two important groups of soils in Kent County, the well-drained soils and the poorly drained. These soils correspond closely with two geologic formations—the Wicomico and the Talbot. The soils of the county are primarily products of the climate and the topographic environment rather than of differences in the character of the underlying materials. The older, or Wicomico, formation underlies the higher parts of the county, that is, the northern, north-western, and south-central parts. These two formations consist of unconsolidated beds of sands, clays, and sandy clays, and, as the Wicomico lies at higher elevations than the Talbot, natural drainage ways have penetrated practically all areas of this formation. As a result, the surface relief is undulating or gently rolling and natural drainage has been established. These conditions have favored aeration and oxidation and have allowed the development of normal soil profiles in most places underlain by this formation.

The underlying material of the Wicomico formation in most places consists of beds of sand, gravel, or sandy material, and these have allowed good drainage conditions for the overlying material. The thorough oxidation of the iron salts gives the reddish-brown color to the B horizons of the Sassafras soils, hence the red soil colors in a region of dominantly gray soils.

The Talbot formation, which is more recent than the Wicomico, underlies the marine terraces and flat forelands, which lie at an average elevation of about 20 feet above sea level. This formation occupies the extreme southwestern end of the county, also areas in the western part and in the extreme southeastern corner. These areas are naturally poorly drained, owing to their flat surface and low position, and in many places they present the original constructional form as the material was laid down by the sea. In this formation the soils have not developed normal soil profiles, owing to imperfect drainage, lack of aeration, and lack of oxidation, and in places the beds of heavy sandy clays are several feet deep.

In a few places deposits of greensand marl or glauconitic material are noticeable, especially about one-fourth mile southeast of Kennedy-

ville, 1 mile west of Sandy Bottom, one-half mile north of Hanesville, just east of Stillpond, 2 miles west of Galena, and one-half mile east of that place. The outcroppings of this greensand material occur along the stream courses where erosion has removed the overlying formations. In no place in the county has the surface soil any resemblance to the Collington soils derived from greensand marl material in Anne Arundel or Prince Georges Counties, but the B horizon in some places has been influenced to some extent by this material.

It is generally conceded that the effect of podzolic processes is one of soil impoverishment, especially with respect to the leaching out of the alkaline earths and other soluble material from the surface layer. This has produced an eluviated A horizon in the normally developed soils. An accumulation of iron and alumina has taken place in the B horizon, which makes this layer more highly colored, heavier in texture, and more compact than the A horizon, and it may rightly be termed the illuviated layer of the profile.

The Sassafras soils express the normal characteristics and natural processes of weathering. In the B horizon, the weathering is the most complete, and uniform color and consistence have been produced in each of the Sassafras soils mapped in Kent County.

In the northwestern part of the county, on some of the higher and flatter areas of Sassafras silt loam, a well-defined hardpan layer has developed. The hardpan layer lies at a depth ranging from about 18 to 24 inches below the surface, and it consists of mottled light-gray, brownish-gray, or yellowish-gray hard but brittle laminated fine sandy clay material. This represents the oldest soil in the coastal plain of Maryland, and in the southwestern part of the State it has been classed as Leonardtown.

In the group of well-drained soils are Sassafras silt loam; Sassafras silt loam, steep phase; Sassafras loam; Sassafras loam, mixed phase; Sassafras sandy loam; and Sassafras loamy sand. Associated with these soils, but not quite so well drained throughout the profile, are the Keyport soils.

Sassafras silt loam may be considered the normally well-developed soil of the region. The various horizons do not show so much contrast in texture or, in some places, in color as do the horizons of Sassafras sandy loam, yet the lines of demarcation between these horizons are quite distinct. Sassafras silt loam comprises by far the largest area of any one soil in the county and is developed on undulating or gently rolling surface relief at an elevation ranging from 20 to 100 feet above sea level.

A description of a typical profile of Sassafras silt loam, collected four-fifths of a mile east of Kennedyville, from a pasture-grass area, is as follows:

- A. From 0 to 10 inches, light-brown silt loam which is mellow and friable when moist but forms into clods when excessively dry. It contains considerable organic matter.
- B₁. From 10 to 38 inches, reddish-brown silty clay or silty clay loam, which breaks into irregularly shaped lumps and crushes readily into a friable mass under normal moisture conditions. This material is of the same color on the outside as on the inside of the soil lumps. When excessively dry it is hard and compact and forms into clods.
- B₂. From 38 to 72 inches, brownish-yellow loam which is mellow and friable when moist but slightly compact and hard when dry.
- C. From 72 to 82+ inches, yellowish-brown fine sandy loam.

The Elkton soils, occupying flat areas of low elevation and poor drainage, indicate that their profile development has been retarded or influenced by excessive moisture. In areas where surface drainage is imperfect and the soil has been subjected for a long time to the influence of excessive moisture and imperfect internal drainage during parts of the year and to conditions of deficient moisture during periods of dry weather, that is, to alternating wet and dry conditions, the surface soil is gray or nearly white. In a few forested areas there is an accumulation of vegetable matter on the surface. The main subsoil layer, or horizon B, consists of heavier material mottled gray, yellow, and brown. This layer varies in thickness and in structure, but in most places, at a depth ranging from 28 to 34 inches, it is underlain by material which is lighter in color and much more friable. The mottled color of the material throughout the entire profile is evidence of incomplete oxidation.

Occupying a position between the Sassafras and Elkton soils is an intermediate grade of material as regards color, drainage, and structure. These conditions give rise to soils that have been grouped in the Keyport series. The soil profile is somewhat similar to that of the Sassafras soils throughout the A horizon and the upper part of the B horizon, whereas the lower part of the B horizon, or the true subsoil, shows evidence of incomplete oxidation in its mottled gray, yellow, and brown color. It is heavier in texture, is tough, and in many respects resembles the subsoil of the Elkton soils. The mottled condition of the lower subsoil layer is not owing entirely to imperfect drainage but in part to the fact that oxidation has not yet extended below a depth ranging from about 12 to 18 inches. Below the typical subsoil is the light-textured loose material of horizon C, or the parent material.

Following is a profile description of Elkton silt loam, as observed in a wooded area $1\frac{1}{2}$ miles east of Tolchester Beach:

- A₁. From 0 to 1 inch, dark-gray silt loam containing a considerable quantity of organic matter and having a very thin surface covering of leaf mold.
- A₂. From 1 to 11 inches, light-gray rather heavy silt loam having a smooth flourlike feel when moist. The material breaks into lumps when extremely dry and runs together when wet. The light color and high content of silt are the marked characteristics of this layer.
- B. From 11 to 40 inches, mottled bluish-gray and yellowish-brown silty clay which is plastic and tenacious when wet but hard and brittle when dry. Under normal moisture conditions this material breaks into irregular lumps having a smooth, shiny surface of bluish gray, which are mottled with rust brown on the inside.
- C. From 40 to 50 inches, bluish-gray silty clay loam containing light-gray and brownish-yellow mottles. The material in this layer varies greatly within short distances and may range in texture from fine sand to silty clay loam.

The Portsmouth soils are characterized by their black color caused by a high content of organic matter. The subsoils are light-gray, mottled with rust brown, sandy clays or clays having no definite structure or breakage.

In addition to the well-defined and well-established soil types, three classifications of miscellaneous soil materials are mapped in Kent County; namely, tidal marsh, meadow, and coastal beach. Each of these has been described under the section on Soils and Crops.

SUMMARY

Kent County is one of the most northerly counties in the Maryland tier of Eastern Shore Counties. It lies to the east of Chesapeake Bay and between Sassafras and Chester Rivers. The surface relief over the greater part of the county is that of level, undulating or gently rolling areas which are naturally well drained and lie favorably for agricultural operations. There are only a few steep slopes, and fairly extensive broad flat areas are present, particularly in the forelands.

Hard-surfaced roads throughout the county, in addition to both rail and water transportation, afford ample transportation for the products of the county. A great deal of the milk and some of the other crops are shipped directly to Philadelphia and other markets by trucks.

Kent County has a favorable climate for the production of corn, wheat, and hay crops, as well as canning crops. The rainfall is ample and is well distributed throughout the growing season.

The county is thickly settled over all the well-drained part. This is due largely to the fact that perhaps no county of the Eastern Shore of Maryland has a higher percentage of good agricultural soils.

The dominant agricultural soils have brown surface soils and reddish-brown subsoils. These soils belong to the Sassafras group. Extensive areas of poorly drained soils are forested or used for pasture land.

The principal agricultural soil and the one which occupies by far the largest acreage of the soils of the county is Sassafras silt loam. On this soil and on some of the associated soils are produced most of the crops in the county. The undeveloped areas are mainly Elkton soils.

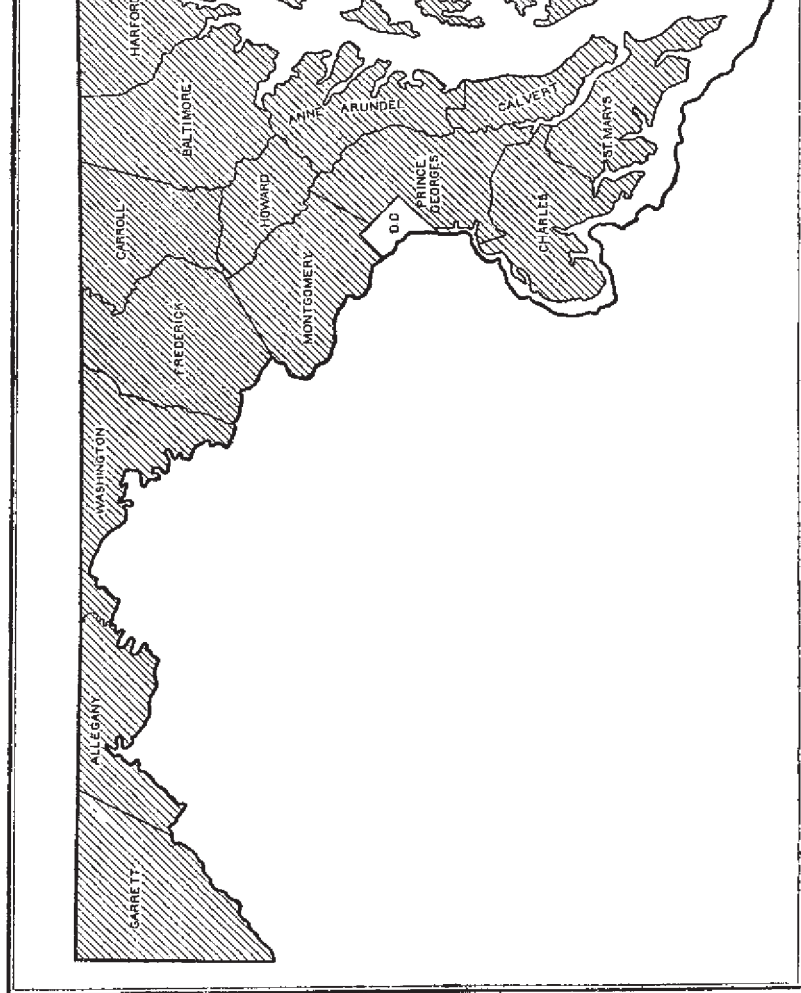
Corn, wheat, and hay are the principal crops grown. Dairying is one of the important industries of Kent County, and in recent years the production of hay crops has gradually increased and the soils have been improved by the application of manures as the result of dairying. Canning of tomatoes, English peas, and sweet corn are of considerable importance. Practically one-third of the asparagus grown in Maryland is produced in Kent County. Some revenue to the inhabitants is derived from fishing in Chesapeake Bay and the adjacent rivers.

Kent County may be rightly considered as one of the best agricultural counties of the State, and this is attested by the good farm buildings and prosperous appearance of every well-established farm.



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Areas surveyed in Maryland, shown by shading. Detailed surveys shown by northeast-

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